

Headquarters U.S. Air Force

Integrity - Service - Excellence

Navstar

Global Positioning System Case Study



U.S. AIR FORCE

**March 2002
AF/XPPL**



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Introduction

- **Navstar Global Positioning System (GPS) evolved from a military need for a global precision navigation system.**
- **The Defense Navigation Satellite Development Program (DNSDP) was chartered as an Air Force Executive Agent on April 17, 1973.**
 - **Air Force assigned by DepSECDEF as Executive Agent**  [Click here to see document](#)
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- **The Air Force was responsible for overseeing all aspects of preparing detailed plans for the DNSDP and managing and executing the program.**
 - **Air Force was given specific duties with respect to the administration of this Executive Agent**  [Click here to see document](#)



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Introduction

- **In August 1973, the Defense Systems Acquisition Review Council (DSARC) disapproved the original concept for Navstar due to lack of cross service coordination and consideration. On December 17, 1973 a modified, combined concept was approved by DSARC.**
 - **The EA assignment document specifically stated the need to coordinate and integrate the Air Force, Navy and Army efforts**

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Historical Background

- **1972: Two Navy and one Air Force system were in the testing phase.**
- **Spring 1973: Department of Defense (DoD) assigned the Air Force as the Executive Agent of the DNSDP.**
- **August 1973: Only the Air Force system was briefed to the DSARC II in August of 1973 and was disapproved.**
- **December 1973: A new concept incorporating the best of both the Air Force and Navy systems was approved at DSARC III.**
- **1993: The DoD and Department of Transportation (DoT) became joint managers of the program.**
- **1994: The system achieved full operational capability and was integrated into the US Air Traffic Control System.**



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The Solution

- **NAVSTAR GPS is a space-based radio-positioning system nominally consisting of a constellation of 24 satellites providing navigation and timing information to military and civilian users worldwide.**
- **In addition to the satellites, the system consists of a worldwide satellite control network and GPS receiver units that pick up signals from the satellites and translate them into position information.**
- **Delta II expendable launch vehicles are used to launch the GPS satellites from Cape Canaveral Air Station, Fla., into six circular orbits of nearly 11,000 nautical miles.**



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The Technology

- **GPS provides the following:**
 - **Extremely accurate, three-dimensional location information**
 - latitude, longitude, and altitude
 - within meters
 - **Extremely accurate velocity information**
 - within a fraction of a mile per hour
 - **Precise timing services**
 - within 100 nanoseconds
 - **Continuous real-time information**
 - **Accessibility to an unlimited number of worldwide users**
 - **Civilian user support at a slightly less accurate level**



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Conclusions and Future Impact

- **The NAVSTAR program serves as an example of a very successful application and follow through of the Executive Agent concept.**
- **This program has now become completely Joint with all services and other agencies contributing to the continued success.**
- **The Air Force continues to serve as the NAVSTAR Executive Agent.**
 - **Continues until voided or replaced by the SECDEF OR DEPSECDEF**
- **Because of the success it is possible that NAVSTAR Executive Agency could be retracted with no adverse effects to the program.**

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Combat Support & Analysis Division

End of Case
Study



THE DEPUTY SECRETARY OF DEFENSE
WASHINGTON, D. C. 20301

APR 17 1973

MEMORANDUM FOR THE SECRETARIES OF THE MILITARY DEPARTMENTS
SUBJECT: Defense Navigation Satellite Development Program (DNSDP)

There is general agreement that military users would benefit from global deployment of a precision navigation system. Such a system would provide flexibility, independence of foreign ground-based equipments, and advantages in survivability against physical and electronic attacks. Furthermore, if high accuracies (30-60 feet) could be achieved, significant improvements in artillery fire direction, surveillance, and blind bombing could accrue. On the other hand, implementation costs of such a system would be high *and* we must understand the system's cost and value before we can decide whether to acquire it.

I have concluded that we should proceed to DSARC with the formulation of a Defense Navigation Satellite Development Program (DNSDP) to test and evaluate the concepts and costs of an advanced navigation system, including a variety of sea, air, and ground-based user equipments. The main purpose of the program will be to clarify cost and value relationships of navigation satellite systems and to produce the technical information and user experience needed to form a basis for a decision on whether to deploy an operational Defense Navigation Satellite System (DNSS) for use during the 1980s.

This must be a joint Services program. I am designating the Air Force as the Executive Service for the DNSDP. Accordingly, the Secretary of the Air Force is requested to undertake the necessary coordination, to assign a Program Manager and to establish a joint Army, Navy, Marine Corps, Air Force Program Office which will prepare detailed plans for the DNSDP and will manage and execute it if it is approved. The Secretaries of the Army and the Navy will provide for their Department's participation in the Joint Program Office and will ensure that their elements of the DNSDP are directed at the establishment of a comprehensive and integrated DoD system.

The DNSDP and the plan for its implementation will be described in a DCP submitted by the DNSDP joint Program Office by July 1973 for DSARC review. The plan for the implementation of the DNSDP should reflect the following guidelines:

1. As a baseline experimental program, the Air Force would design and deploy during 1977 a constellation of four synchronous, repeater Navigation Experimental Satellites (NES) and ground-based control, tracking, and signal generation stations. The constellation would be employed by the technical and operational communities of the three Military Departments for developmental testing, operational testing and evaluation, demonstrations and training.

AF assigned as
Executive Agent

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AF assigned
specific duties

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Executive Agent
applies to at least
two components

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objectives of obtaining required performance, high-reliability, and low unit-production and ownership costs.

4. Costs of the baseline program should not exceed the following ceilings (in \$ millions):

	FY 74	FY 75	FY 76	FY 77	FY 78	TOTAL
Army	3	5	6	2	2	18
Navy	3	7	5	2	2	19
Air Force	<u>11</u>	<u>40</u>	<u>60</u>	<u>40</u>	<u>16</u>	<u>167</u>
TOTAL	17	52	71	44	20	204

Effective until
revoked or
replaced

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5. The joint Program Office would invite concerned non-DoD Government agencies to participate in the DNSDP, including program planning, user equipment design, and system tests. In addition, civil user needs should be considered in the design of the space-borne equipment.

The DNSDP DCP should include information on (1) system and component designs; (2) detailed test plans; (3) detailed schedules and costs; (4) management arrangements; (5) user terminal equipment numbers, costs, and availability; and (6) use of the DNSDP results to support the decision on the operational DNSS. Except for the NTS-1, no commitment to procure the satellites and required launch vehicles will be made prior to review of the DNSDP by a DSARC to be held by August 1973.

The DNSDP joint Program Office will, in the meantime, undertake system and hardware definition and will conduct supporting studies, including examination of (1) DNSS accuracy and cost tradeoffs; (2) projected military value of the DNSS; (3) alternate (to the baseline) DNSS development programs; (4) possible alternatives for obtaining needed navigation capabilities by alternative or complementary means; (5) relationship of the DNSDP and the DNSS to other navigation programs; and (6) vulnerability of the DNSS. The results of these efforts will be presented at the DSARC review of this program. The DNSDP Program Manager will keep the Defense Navigation Planning Group, recently established by DDR&E, apprised of the status and progress of these efforts.

Signed by
SECDEF or
DepSECDEF

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William Y. Clements, Jr.